Mite Control and Damage to Arizona Citrus[1]

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Abstract

Lemons were left untreated or treated for mites with Danitol (fenpropathrin). Mite populations were estimated and yield and fruit damage was accessed. Yuma spider mite, Eotetranychus yumensis, was the predominate mite species present during the high fruit susceptibility period. Although there was no apparent impact of mites on yield in this study, there was significant fruit damage that could be attributed to Yuma spider mite. The damage appeared as bronzed colored pitting of the fruit peel. Based on damage ratings, the treated plots produced 56% fancy, 34% choice, and 10% fruit grade based on mite damage, whereas the untreated plots produced 47%, 31% and 22% fancy, choice and juice grade fruit respectively. Statistically, the treated plots produce more fancy and less juice fruit, but did not differ in choice fruit. Although the treated areas produced better quality fruit, the amount of damage suffered in those plots was higher than desired. Fruit in the treated plots likely suffered some mite damage before treatments were initiated. In addition to the fruit damage test, a miticide efficacy test targeting Yuma spider mite on lemon was conducted comparing Agri-Mek, Danitol, Kelthane, Microthiol, and Nexter to an untreated check. Agri-Mek, Nexter, and Microthiol offered 14 days of control; although at 6 DAT Agri-Mek and Nexter did not differ from the untreated. Danitol and Kelthane contained fewer mite that the untreated for at least 35 DAT.

Introduction

In Arizona we have a number of species of mites that attack citrus. These pests do not build high populations regularly, but can be found most years. Mites in citrus damage leaves by extracting sap causing the leaves to become speckled, yellowed, and bleached. Although foliar damage is usually not economically important, severe damage can result in leaf shed which can result in stunting of younger trees. The primary concern of mites in citrus occurs when the mites feed on the fruit. On the fruit mites will feed where small abrasions occur such as thrips oviposition sites, thrips feeding scars, or scars from wind and branch abrasions. Additionally, stippling of the fruit can occur which is usually not evident until the fruit has colored. In Arizona, the most common mite pests include the flat mite, *Brevipalpus lewisi*, Texas citrus mite, *Eutetranychus banksi,* Yuma spider mite, *Eotetranychus yumensis*, and twospotted spider mite, *Tetranychus urticae*. The flat mite (FM) is very common in the Yuma area, and is most abundant from late spring to fall. Although FM can be found on the foliage, it prefers to feed on the fruit where it can cause a great deal of damage. The Texas citrus mite (TCM) is a cool season mite found primarily during early spring. TCM is a foliar mite that prefers to feed on the upper surfaces of leaves but will move onto the fruit when populations are high. TCM populations are often brought under control by an entomopathogenic fungus, or when sustained temperatures in the 90's F occur. The Yuma spider mite (YSM) is another common foliar mite,

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but unlike the TCM it prefers to feed on the underside of leaves. It too will move to and feed on the fruit under high populations. Although the YSM is a pest of citrus, it also has some beneficial attributes. The YSM is omnivorous and in addition to feeding on plant tissue will prey on other small arthropods including mites and thrips. YSM can be found in the year round, although its populations will often subside in late summer when temperatures are high. The twospotted spider mite (TSM) is not as common as the other mites and usually occurs in mid to late summer. This mite infests the undersides of leaves and the fruit, and produces a great amount of webbing. Because of its propensity to feed on the fruit, it can be especially damaging. In this study we investigated the damage potential of mites on lemons grown on the Yuma Mesa, and we evaluated the efficacy of several miticides.

Materials and Methods

Damage Study

This study was conducted in a eight acre block of twelve-year old 'Limoneira 8A Lisbon' lemon trees grown at the Yuma Mesa Agricultural Center. The trial consisted of two treatments, one where the mites were controlled and the other where the mites were left unchecked. The test was a randomized complete block design with four replicates. Each plot was eight trees wide by ten trees in length, comprising approximately one acre in size.

The entire test was over sprayed with Orthene (acephate) at 1 lbs/ac for thrips control and to help flare mites on 17 April and 20 May. Danitol (fenpropathrin) was applied to the treated plots for mite control on 10 June and 17 July. All spray applications were applied with a standard orchard sprayer calibrated to deliver 100 gal/ac at 100 psi.

To evaluate mite population density, ten pieces of fruit were collected per plot and transported to the laboratory where they were inspected under a dissecting microscope. The numbers of mites were counted according to species. Evaluations were made at weekly intervals throughout the duration of the trial.

On 25 September, damage to the fruit due to mites was accessed. One hundred fruit per plot were rated for scarring. The scarring in this trial appeared as small pits in the fruit rind. Damage was accessed by determining how much of the fruit surface contained these pits. Each fruit was divided into quadrants and rated on a 1 to 5 scale, with 1 = no damage to any of the quadrants, 2 = pitting on one of the quadrants, 3 = pitting on two of the quadrants, 4 = pitting on three of the quadrants, and 5 = pitting on all of the quadrants. In general, ratings of 1 or 2 would grade as fancy fruit, a rating of 3 would grade as choice, and a 4 or 5 would grade out as juice quality.

Fruit from each tree was harvested by hand using professional pickers from a local packinghouse. The experimental block was harvested three times, 10 October 2002, 19 November 2002, and 2 February 2003. For the first two harvests, the pickers sized the fruit on the tree, using a #9 metal ring with a diameter of the minimum marketable size for that date, as determined by the packinghouse. All the fruit was stripped on the third harvest. Fruit from each plot was harvested into plastic bins. Yields for each plot were estimated as whole and fractional bins of harvested fruit.

Miticide Efficacy Study

This study was conducted on eight-year old 'Limoneira 8A Lisbon' lemon trees grown at the Yuma Mesa Agricultural Center. The test was a randomized complete block design with four replicates. Each plot consisted of three trees.

The treatments included: am untreated check, Kelthane MF (dicofol) at 6.0 pts/ac, Danitol (fenpropathrin) at 21 oz/ac, Nexter (pyridaben) at 8 oz/ac, Agri-Mek (abamectin) at 8 oz/ac, and Microthiol (sulfur) at 10 lbs/ac. All treatments included Kinetic non-ionic surfactant at 0.1%v/v and were applied with vertical boom sprayer calibrated to deliver 100 gal/ac. Treatments were applied on 17 July 2002.

The mite population was estimated by removing 10 fruit per plot, transporting them to the laboratory, and counting the number of mites per fruit by species using a dissecting microscope. Although some FM and TSM were present in this test, over 85% of the population was YSM. Samples were taken on 23 and 31 July, 8, 14 and 21 August.

All data were analyzed using an ANOVA and an F protected LSD ($P<0.05$).

Results and Discussion

Damage Study

The mite populations were moderate in early June made up primarily of YSM (Figure 1). Immediately following the first application of Danitol on 10 June, the YSM population dropped significantly in both the treated and untreated areas (Figure 1). The reason for the drop in the untreated area is not certain, but may have been due to interplot spray drift in combination with a highly susceptible mite population. In late June and early July the YSM was beginning to increase so another application of Danitol was applied on 17 July. Following the second application, there was a slight decline in the YSM population in both the treated and untreated areas, but by late July the YSM had quickly rebounded in the untreated areas, and some FM and TSM were also evident (Figure 1). Mites in the treated plots remained low until early-September when TSM began to increase. The TSM were not treated since they were relatively low in number and it was late in the season when little if any damage was likely. Based on these data, YSM was the most prevalent mite present when the fruit would be most susceptible to damage (petal fall through August).

Mite damage was evident in this trial; however we did not detect any differences in yield. Based on mite densities, most of the damage was attributed primarily to YSM. The damage appeared as bronzed colored pitting of the fruit peel. Based on damage ratings, the treated plots produced 56% fancy, 34% choice, and 10% fruit grade based on mite damage, whereas the untreated plots produced 47%, 31% and 22% fancy, choice and juice grade fruit respectively (Figure 2). Statistically, the treated plots produce more fancy and less juice fruit, but did not differ in choice fruit. Although the treated areas produced better quality fruit, the amount of damage suffered in those plots was higher than desired. Fruit in the treated plots likely suffered some mite damage before treatments were initiated. More research is required to adequately determine a relationship between mite density and the amount of scarring that occurs.

Miticide Efficacy Study

YSM was the predominant mite species in this trial. On 15 July, YSM were averaging approximately 5 mites per fruit across all treatments. Six days following application (DAT), YSM were significantly reduced in all treatments except Agri-Mek and Nexter, but by 14 DAT all of the treatments similarly had fewer YSM than the untreated (Figure 3). In this test we used low, but labeled rates of Agri-Mek and Nexter to make these products cost competitive. This may explain the slower response to these products. At 22 DAT, Microthiol and Nexter were the only treatments that did not differ from the untreated, and Agri-Mek, Danitol, and Kelthane were similar (Figure 3). No statistical differences were detected at 28 DAT, and at 35 DAT, Danitol and Kelthane were the only treatments still offering significant YSM control. Overall, Kelthane and Danitol were the best treatments evaluated, followed by Agri-Mek and Microthiol.

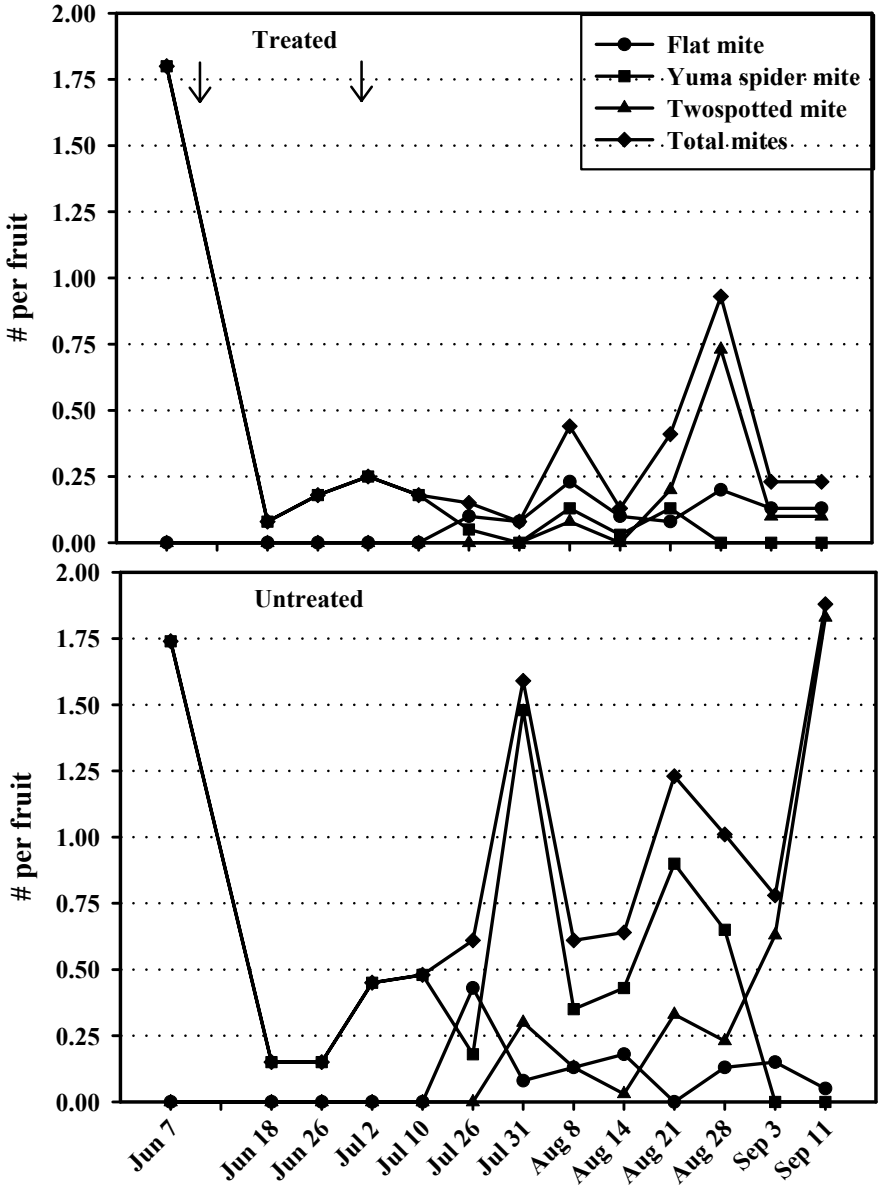

Figure 1. Number of mite per fruit on lemon treated with Danitol at 21 oz/ac or untreated.

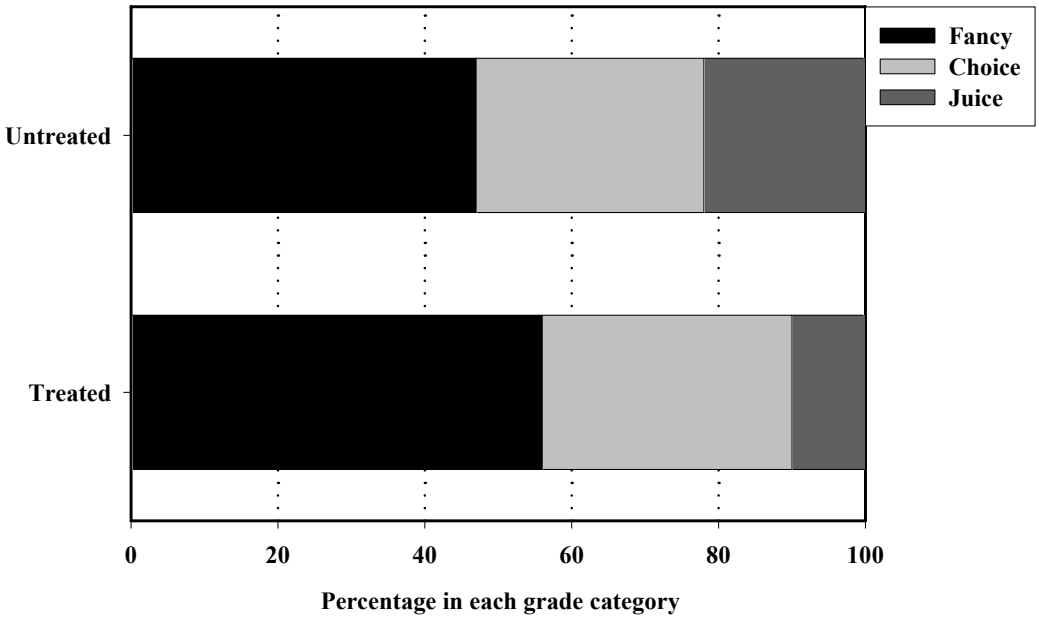

Figure 2. Frequency distribution of lemon fruit graded based on scarring caused by mites.

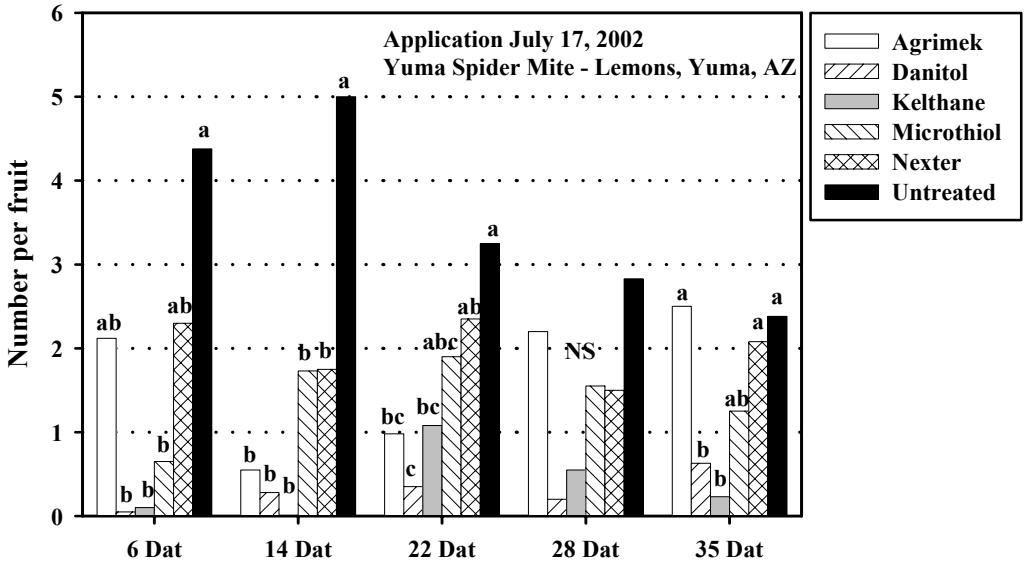

Figure 3. Number of Yuma spider mites per fruit following a single miticide application. Bars within a DAT followed by the same letter are not significantly different based on an F protected LSD (P<0.05).